We claim:

1. A method of making a metal tube which comprises

(A) providing an assembly which comprises

(1) a metal tube blank, and

(2) an elongate metal core which is surrounded and contacted by the tube blank;

(B) elongating the assembly by mechanical working thereof until the tube blank has been converted into a tube of desired dimensions;

(C) after step (B), subjecting the core to a treatment which (i) results in the core being in a stable stretched condition throughout its length, and (ii) does not substantially stretch the tube; and

(D) removing the stretched core from the tube.

2. A method according to Claim 1 wherein the core is composed of a metal which, when stretched under the conditions in step (C) in the form of a fully annealed sample,

(i) first stretches elastically until an elastic limit is reached, at which time the length of the sample is S_1 and the stretching force is F_1, and

(ii) then stretches plastically, without breaking, until (a) the length of the sample reaches a second value S_2 which is at least 1.06 S_1 and (b) the stretching force reaches a second value F_2, where F_2 is at least 1.4 F_1.

3. A method according to Claim 2 wherein F_2 is at least 3.0 F_1 and S_2 is at least 1.2 S_1.

19.

4. A method according to Claim 3 wherein step (C) comprises stretching the core until its length is at least 1.15 S_1, the stretching being carried out in a single step or in two or more steps without any treatment between the steps which substantially changes the response of the core to further stretching.

5. A method according to Claim 4 wherein the length of the sample is at least 1.03 S_1 when the stretching force is (F_1 + 10,000) psi.

6. A method according to Claim 4 wherein the length of the sample is less than 1.03 S_1 when the stretching force is (F_1 + 10,000) psi.

7. A method according to Claim 2 wherein step (C) comprises in sequence

(1) stretching the core,

(2) heating the stretched core from step (1), thereby removing at least some of the stresses in the core, and

(3) cooling and stretching the core from step (2).

8. A method according to Claim 7 wherein the core is stretched while it is cooling.

9. A method according to Claim 7 wherein the core is stretched after it has cooled.

10. A method according to Claim 7 wherein

(i) a work-hardened tube is prepared in step (B),

(ii) the assembly from step (B) is subjected to a treatment which removes at least some of the stresses from the core but does not remove all of the stresses from the tube, and

(iii) in step (2) the heating of the stretched core does not remove all the stresses from the tube.

20

6/21/97

B

11. A method according to Claim ~~1~~ ~~24~~ 1 wherein the tube, after step (B), has an inner diameter D_2 mm, and in step (C), the core is stretched from a first length L_0 mm to a stable stretched length L_2 mm which is at least p times L_0, where

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$$p = \frac{D_2^2}{(D_2 - 0.025)^2}.$$

12. A method according to Claim 11 wherein D_2 is at most 12.7 mm.

B

13. A method according to Claim ~~1~~ ~~24~~ 1 wherein the core is composed of a shape memory metal having a martensite start temperature M_s and a martensite finish temperature M_f and wherein the core is at a temperature below M_s when it is stretched in step (C).

14. A method according to Claim 13 wherein the core is at a temperature between M_s and M_f when it is stretched in step (C).

15. A method according to Claim 13 wherein the core is at a temperature below M_f when it is stretched in step (C).

B

16. A method according to Claim ~~1~~ ~~24~~ 1 wherein the core is composed of an alloy comprising nickel and titanium.

B

17. A method according to Claim ~~1~~ ~~24~~ 1 wherein the core is composed of an alloy selected from the group consisting of

(1) alloys consisting essentially of nickel in amount 55.5 to 56.0% and titanium in amount 44 to 44.5%,

(2) alloys consisting essentially of titanium in amount 44.5 to 47%, 0.1 to 2% of one or more of iron, cobalt, manganese, chromium, vanadium, zirconium, niobium, molybdenum, hafnium, tantalum and tungsten, and the balance nickel; and

(3) alloys consisting essentially of titanium in amount 44 to 44.5%, 0.1 to 20% of one or more of copper, silver and gold, and the balance nickel.

21

B 18. A method according to Claim ~~1~~ ~~24~~ 1 wherein the tube blank is composed of a metal selected from the group consisting of

(1) alloys comprising nickel and titanium,

(2) alloys containing at least 80% titanium,

(3) titanium,

(4) zirconium,

(5) hafnium,

(6) nickel aluminide, and

(7) titanium aluminide.

B 19. A method according to Claim ~~1~~ ~~24~~ 1 wherein there is a lubricant between the core and the tube blank.

20. A method according to Claim 1 wherein the assembly, at the end of step (B), has a length of at least 100 meters, and is cut into lengths of less than 35 meters prior to step (C).

B 21. A method according the Claim ~~1~~ ~~24~~ 1 wherein the elongated assembly from step (B) is cut into discrete lengths, at least one of the discrete lengths is subjected to a mechanical treatment which results in a continuous or stepped taper over at least part of the assembly, and step (C) is carried out on the tapered assembly.

B 22. An assembly which is suitable for use in a method as defined in Claim ~~1~~ 24 and which comprises

(1) a metal tube blank, and

(2) an elongate metal core which is surrounded and contacted by the tube blank and which is composed of a metal such that after the assembly has been elongated by mechanical working thereof, the

22

core can be converted into a stable stretched condition which permits the core to be physically withdrawn from the tube.

23. A seamless metal tapered tube in which the ratio of the outside diameter to the inside diameter is substantially constant.